

Preparation of All-Ceramic, High Performance Li-ion Batteries for Deep Space Power Systems, Phase I

Completed Technology Project (2005 - 2005)



Project Introduction

Lithium (Li) ion batteries are among the most promising power sources for many civilian, military and space applications due to their high power and high energy densities. However, current state-of-the-art Li-ion batteries are not suited for operation in deep-space environments including high radiation and an extremely wide operation temperature regime (-100°C to 400°C), due to utilization of thermally and electrochemically unstable organic electrolytes. TPL proposes to develop an all-ceramic, high performance Li-ion battery for deep-space power systems via a novel cell configuration, micro-fiber cells (MFCs), that ensures successful utilization of ceramic materials for all battery components. The superior properties of the proposed MFC-based Li-ion batteries will be achieved via formation and processing of functional graphite fibers that facilitate interfacial contacts and practical utilization of ceramic electrolytes. In Phase I, TPL will fabricate the proposed MFCs via a solution approach and process the MFCs into rechargeable batteries having a wide operation temperature window, excellent radiation resistance, and a high specific energy. The functional fibers will be structurally characterized and MFC-based batteries will be electrochemically evaluated in the temperature regime. The concept of MFCs will be demonstrated. TPL has extensive experience in Li-ion battery chemistries and technologies. TPL's technical and management teams are well positioned to move this technology into the market.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
TPL, Inc.	Supporting Organization	Industry	Albuquerque, New Mexico

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.2 Energy Storage
 - └ TX03.2.1 Electrochemical: Batteries

Primary U.S. Work Locations

New Mexico	Texas
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